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Two New Astigmatic Charts

Presented

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ILLUSTRATED

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TWO NEW ASTIGMATIC CHARTS.

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The two charts that I wish to describe are identical in principle, but differ somewhat in detail, one being designed to determine the axis, while the other is to be used for estimating more especially the amount of astigmatism. The principle upon which the charts are constructed is best illustrated in the latter, Fig. 1. This consists of a disk pivoted through its center to a flat board upon which degrees are marked off so that the disk can be rotated any number of degrees desired. Lines are drawn upon the disk as illustrated in the diagram; the two wide lines at right angles to each other are to be compared by the patient, the disk having been so rotated that one of these lines corresponds to the axis of astigmatism.

It is evident that if one of the wide lines appears more distinct to the astigmatic patient, the fine lines at right angles to it will appear blurred, while at the same time the fine lines at the right angles to the less distinct of the two wide lines will appear comparatively sharp. In this way the apparent difference in distinctiveness between the two wide lines is increased, since the sharp line is made to appear still sharper by contrast with its more or less uniformly blurred background, and the blurred line appears still more blurred because of the fine lines at right angles to it having become distinct. In effect, it seems as if the blurred wide line were hidden behind the sharp fine lines.

Another advantage of the fine lines is due to the fact that while they exaggerate the apparent difference in distinctness between the two wide lines, they also decrease the total amount of light reflected from the chart, thus rendering the latter less fatiguing to the eyes. The fine lines are an additional advantage in that astigmatism of low grade may be estimated by having the patient confine his attention to them and ascertaining which pair of quadrants are the more distinct. In this way, too, after the amount of astigmatism has been determined by the aid of the wide lines, it may be confirmed by the fine lines.

The chart for determining the axis of astigmatism, Fig. 2, requires little explanation. The circumferences here produce much the same effect as the fine lines in the other chart. In labeling the lines, I prefer very large Arabic numerals placed opposite alternate lines as shown in the diagram. This renders it easy for the patient to read the numbers even when they are very much blurred.

The axis of astigmatism may also be determined by the chart first described. This is done by suitably blurring the lines by means of a convex lens or its equivalent, and then rotating the disk back and forth

FIG. 1

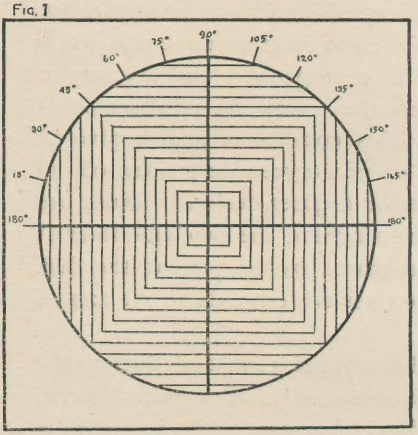
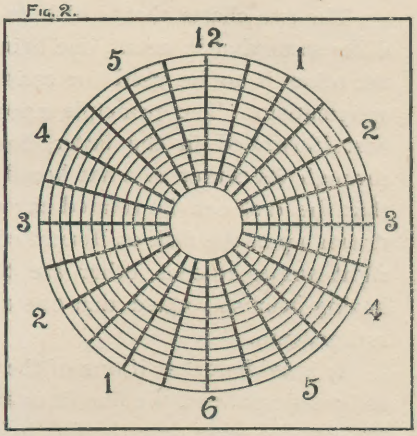


FIG. 2.



until the more distinct of the two wide lines reaches a position at which it appears most distinct to the patient. Another method is to rotate the disk until the two lines appear equally distinct. The axis will then lie half way between the two lines. Both of these methods are often very accurate and should never be omitted, at least as confirmatory tests. The latter method, so far as I know, has not previously been described.

It is a mistake, I think, to make the lines on astigmatic charts so narrow as to subtend the visual angle of 1' as Green* and later, Wallace† have done. Green gave no reason for doing this, while Wallace did so simply because he thought the lines should be made upon the same principle as test letters. Test lines, however, are used in a different way from test letters and I cannot see how any relation can be established between them. The object to be attained in charts is to have the lines so constructed that for a given amount of astigmatism there will be the

*Transactions American Ophthalmological Society, 1869, page 131.
†University Medical Magazine, Philadelphia, 1889-90, II, 13-15.

greatest possible apparent difference in distinctness between them. Moreover, this difference in distinctness must be due as far as possible to astigmatism alone.

It seems to me that the width of lines must be decided upon for the most part by experimentation, but provided that slight differences in distinctness can still be made out in them, the wider the lines are the better, since wide lines when blurred do not show the effect of positive or negative aberration so markedly as narrow lines. A not unimportant objection to the use of narrow lines, lies in the fact that when they are blurred to an extent sufficient to place them surely out of reach of the accommodation, all become so indistinct as to render it impossible for the patient to recognize any differences among them when the astigmatism is of low grade or is partially corrected. Where a cycloplegic is used, this objection, of course, does not apply.

On the other hand, if the lines are too wide, it is equally difficult to judge of the variations in distinctness due to low grades of astigmatism. To get the maximum effect, the lines should be varied in width according to the amount of astigmatism, but practically, of course, it is only necessary to construct lines suitable for low grades of astigmatism, since high grades produce sufficient apparent differences no matter what the width of the lines.

In most astigmatic charts the test lines consist of three stripes. This I consider disadvantageous for the stripes are so close together that the blur from one stripe may at times reinforce, as it were, the blur from the others, thus giving an appearance of distinctness which may be very deceptive when it comes to estimating the relative distinctness of the lines on the chart. It is for this reason that I have placed the fine lines on the charts so far apart.

In the two charts described above, I have adopted the following measurements: Width of wide lines, 3.75 mm.; width of narrow lines, 1.1 mm.; distance between narrow lines, 6.5 mm.; diameter of disk, 31 cm. The chart for determining the axis of astigmatism should be as large as it conveniently can be made. The charts are to be viewed at twenty feet, the usual distance.

These charts may be obtained from E. B. Meyrowitz, New York.

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